

## Color Theory

by Chris & Trish Meyer, Crish Design (formally known as CyberMotion)

### Why do some colors work better together than others?

Ah, the joys of being able to create moving media all by ourselves: Not only do we need to master editing, animation, typography, and sound, we also need to be able to pick suitable colors for logos, type, and lower thirds. However, not everyone has an intuitive sense of which colors work together. In the next three articles, we'll discuss basic color theory, tips for selecting a color palette, and how to remember and easily change those colors during a job.

#### Which Wheel?

Many of us are familiar with the RGB (red, green, and blue) color wheel that appears in color pickers for most applications. This wheel is based on additive colors – for example, if you were to aim red, green, and blue flashlights at the same spot on a white wall, the result would be a pool of white light. A similar phenomenon occurs with the red, blue, and green colors in a monitor.

However, traditional color theory is based on a subtractive model, where a surface absorbs or reflects different wavelengths of white light in order to produce the final "color." This color wheel features red, yellow, and blue as its primary colors. Mix all of the colors together and shine a light on them, and you get black rather than white.

*Figure 1: Some software color pickers (such as the Apple system color picker shown here) are based on the additive color wheel (a), where red, green, and blue are the primary colors. However, most artists pick colors using the subtractive color wheel (b), where red, yellow, and blue are the primary colors.*

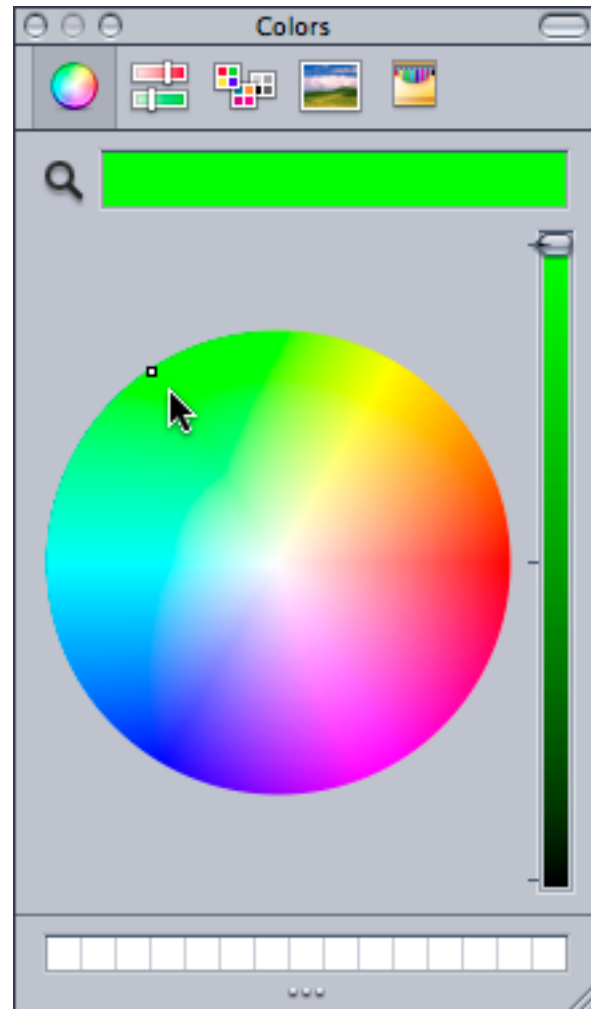


Figure 1a

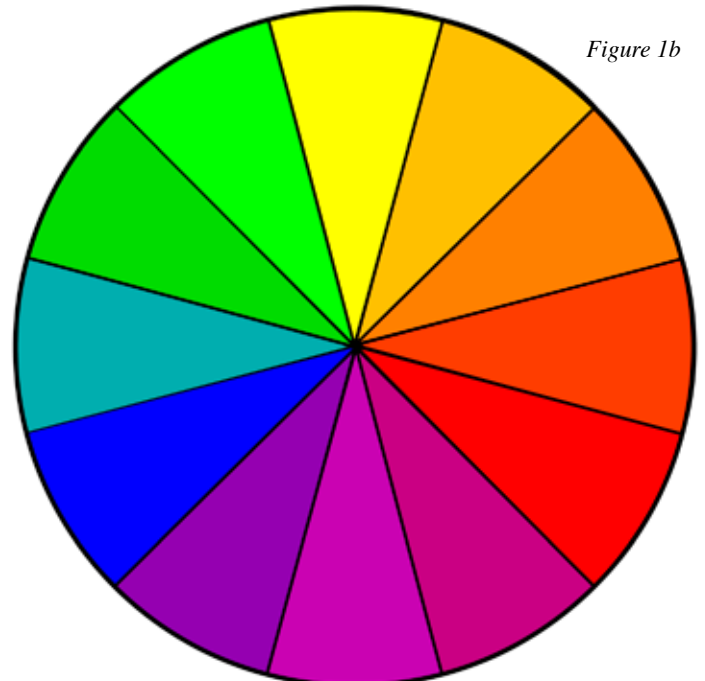


Figure 1b

This subtractive color wheel – not the additive RGB wheel – is the one used most often by fine artists when selecting a color palette. (Note that commercial printers use the additive secondary colors of magenta, yellow and cyan as their subtractive “primaries” instead of red, yellow and blue.)

Remember that the following rules apply to the subtractive or “artist’s” color wheel (red-yellow-blue), so staring at color pickers inside many software applications won’t help you choose appropriate colors. However, there are a number of color wheel applications available for helping artists select colors using the RYB model. One we’ve found useful is Color Theory, which can be used as a standalone application or an After Effects plug-in. Originally created by Matt Silverman and Garrick Meeker, Color Theory was part of the Digital Anarchy Suite acquired in 2008 by Red Giant Software. According Red Giant’s press release (<http://www.redgiantsoftware.com/featured-news/da-faq/>), Color Theory will be released as a free product in 2009.

## Analogous and Complementary Colors

Now that we have the correct color wheel in front of us, let’s use it to help pick colors that work together well.

Many fine artists work with pure pigment color (usually squeezed out of a paint tube), and it takes a fair amount of practice and experience to create the desired color every time – not to mention trying to repeat the color on another job! (Luckily for us, we can easily click and save a color swatch, and never think too hard about how it was made – but we’ll discuss that later...) However, perhaps because artists have had to learn to mix colors, over the years they have devised rules to enable them to design a painting using harmonious colors. Few of these rules directly apply to computer artists, but the rule of analogous and complementary colors along with color temperature can prove useful in any medium.

Red, yellow, and blue are referred to as the three primary colors: the basic components from which other colors are created. When you mix adjacent primary colors, you get the three secondary colors of orange (red+yellow), green (yellow+blue), and purple (blue+red). Tertiary colors are the six intermediate colors formed by mixing a primary with a secondary (yellow-green, red-violet and so on). Of course, once you take into account variations in lightness and saturation, you have a much wider range of colors to work

with (millions to trillions, to be exact).

If you are looking to pick a family of colors that work together harmoniously, look at colors that are adjacent to each other on the wheel. These are known as analogous colors. Their proximity means they share a common primary or secondary color as their base, which in turn ties them together.

On the other hand, if you are looking for colors which contrast with each other to create maximum attention – for example, to have an element of a logo “pop” out of a sea of color around it – pick colors which are 180° across from each other on the subtractive color wheel. These are known as complementary colors. Common complementary combinations are blue and orange, yellow and purple, or red and green. (You might immediately recognize these pairs as the colors for several major sports teams...) You can rotate the pair around the wheel to find other combinations, such as turquoise and orange-red.

Note that red and green are seldom used as a pairing: Aside from their strong association as “Christmas” colors, this pair is hard to read by those who have the most common types of color blindness – both are perceived more as yellow (indeed, blue and yellow is a safer combination for the color blind).

It is often a good idea to pick three colors to form a basic color palette: two somewhat analogous colors that harmonize, and then one complementary color that contrasts. This arrangement is sometimes known as a split complementary.



Figure 2a

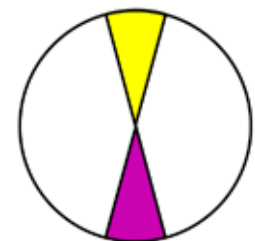


Figure 2b



Figure 2c

Figure 2: Analogous colors (a) reside next to each other on the color wheel, and harmonize nicely. Complementary colors (b) reside across from each other, and provide maximum contrast. Split complementary colors (c) provide a nice trio to use as a basic color palette. Note that you can “rotate” these combinations around the wheel (keeping their relationships the same) to pick a new set of colors.

# Tips & Tricks

More available at [artbeats.com](http://artbeats.com)

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By contrast, it is often advisable to avoid a palette that uses two (or heaven forbid, all three) of the primary colors (red, yellow, and/or blue), unless it's a program for young children. Unfortunately, these colors are often the defaults in many programs. We jokingly refer to red and blue as the "cable ad" colors, as they are so often used by inexperienced producers; red and yellow we often associate with "clown" colors. Fortunately there are lots of tools for you to use to help you create a more sophisticated color palette, which we'll look at in the second part of this series.

Note that if you mix colors across from each other on the wheel, you start to get gray or neutral colors (what a fine artist might call a "muddy" color). This has implications for computer artists too: If you want to animate from one color to another, it is best to animate the hue clockwise or counterclockwise; animating from one color swatch to another will animate directly across the wheel picking up all the gray colors in-between.

## Warm and Cool Colors

Red, yellow, and orange colors are thought of as "warm" colors, and generally remind us of fire, anger, sunshine, and so on. Blue, green and purple are considered "cool" colors, and remind us of calm water or green grass. Certain colors are so intertwined with some themes or emotions (red for Valentine's Day, green for shamrocks, blue for sadness), that it's hard to use anything else without being eclectic. But that doesn't mean you can't find some variations that would be more interesting (such as crimson red, or sage green).

Note that fine artists also consider the temperature of each individual color. For instance, lemon-yellow is a cool yellow while golden-yellow is a warm yellow. Understanding which way a color leans is helpful when physically mixing colors (mixing cool and warm colors can again tend towards mud); computers are more flexible in their ability to mix.

As a result, it can be useful to consider the "rule of dominance." Is a design predominantly warm or cool? You can then use the opposite temperature to add interest around the focal point. Next time you are in an art museum or gallery, see if you can identify paintings that follow this rule. More likely than not, you'll find a painting that is predominantly warm (gold and



Figure 3a

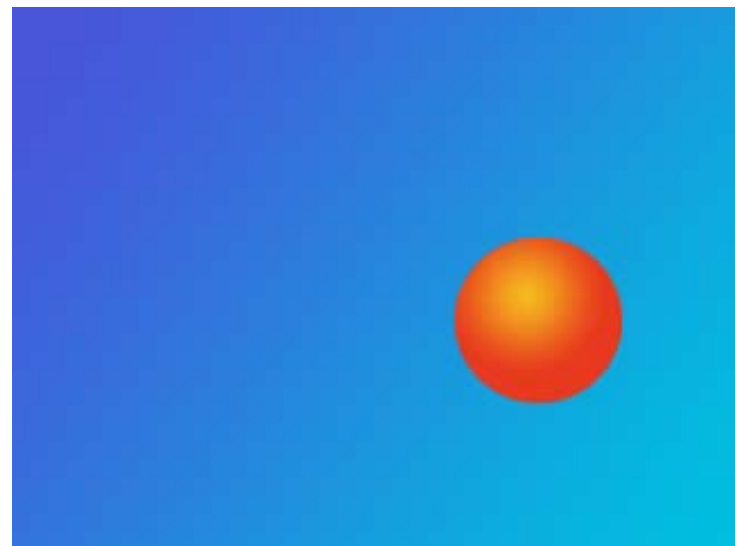


Figure 3b



Figure 3c

Figure 3: Examples of an image that is warm dominant (a), cool dominant (b), and neutral with a splash of warm (c).

red) with a small dash of cool turquoise. Or a painting that is mostly cool (a green landscape) with a small dash of bright red (wildflowers). You'll also find many that are mostly neutrals (or shades of gray) with bright splashes of a warm or cool color around the focal point.

You've probably used this idea of dominance in various ways in video work, such as designing a background of cool dark blues while framing your foreground movie in a warm red or gold frame. The idea of dominance is to avoid an equal mix of warm and cool colors – a perfect balance tends to be boring.

## Readability and Luminance Values

When picking colors to use for text over a background, you also need to pay attention to contrast in the luminance values (not just the hue) between the text and its background. For example, pure red and pure green – even though they are complements – is just about the worst combination you can pick: Aside from the previously-mentioned issue with color blindness, they have roughly the same luminance (grayscale) value. Indeed, don't be afraid to alter the brightness or reduce the saturation of one or more of your colors in order to increase the overall readability of the color

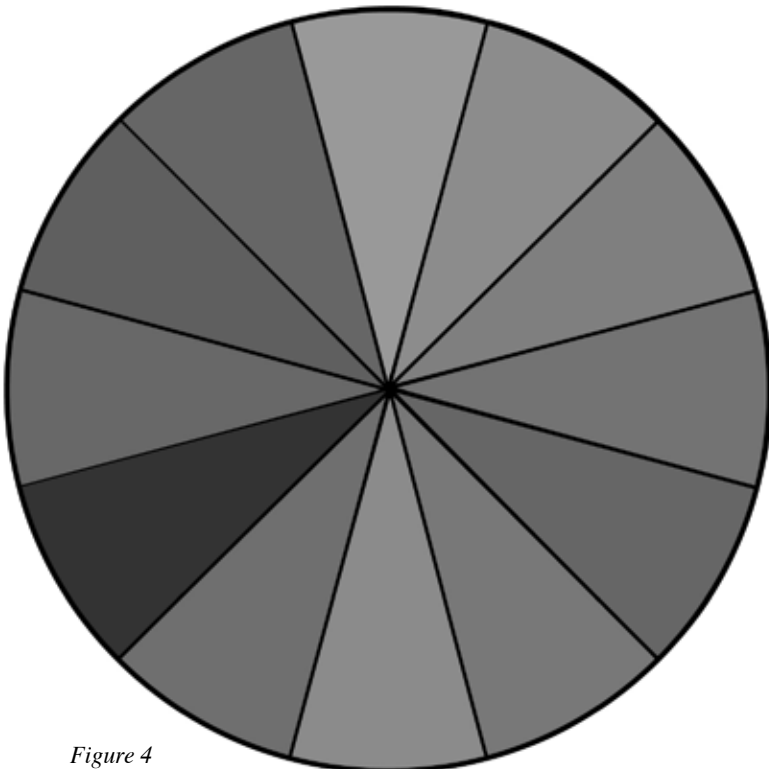


Figure 4

Figure 4: For maximum readability, don't think just about contrasting hues; contrasting luminance values are also important.

combination.

And of course, don't be afraid of using black and white. The combination of black with either white or yellow is considered to be the most readable combinations available. At the other extreme, the combination of yellow and white is virtually unreadable, as again they both have nearly the same luminance values. Same goes for light gray type against white (a combination we see all too often).

But context is important. Print designers are warned against using white text on a dark background, because the slightest problem with registration of the four CMYK plates on the press may make the white text fuzzy and hard to read. But registration is not an issue in the computer world: in fact, in a darkened movie theater, white titles on black are the norm. When reading up on color theory, context is important.

One issue that you will find when designing type for the screen is that antialiasing and compression on small text can make the text harder to read. Consider increasing the spacing (tracking) between the characters a little more than you would for print. If in doubt, you might also pick a less ornate font. Think of US highway and traffic signs where the text is usually large, simple, and well spaced.



Figure 5a

Figure 5: Many traffic signs with text – which must be readable – employ black text over a white or yellow background (a). In the event where the sign is red (for danger), the text is usually white (b). In all cases, the type is very simple without the characters being crowded together. (Clips RC-FH097-041 and RC-FH097-171, both available on Artbeats.com.)



Figure 5b

We're not saying all of your type needs to be as boring as a highway sign. But at the other extreme, if no one can read your type, it may not matter how cool it looks...

### Zooming Out

Now that we've covered the basics of color theory, in the next article we will discuss selecting a color palette – including using Adobe's Kuler utility. In the meantime, you might want to browse the web and brush up on your color theory. A good starting point is [ColorMatters.com](http://ColorMatters.com) (check out the index down the left of the page). For the history of the color wheel, Wikipedia has some interesting links ([http://en.wikipedia.org/wiki/Color\\_wheel](http://en.wikipedia.org/wiki/Color_wheel)). For something more off the wall, check out [YourLogoMakesMeBarf.com](http://YourLogoMakesMeBarf.com), which dissects myriad sins committed with color, typography, and unfortunate choices in shapes.

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*Chris and Trish Meyer are the founders and owners of Crish Design, an award-winning motion graphics studio that has created a wide variety of work for film, broadcast, corporate events, and special venues. They are one of the original development sites for After Effects, and have two books currently in print: [Creating Motion Graphics](#) and [After Effects Apprentice](#).*